The Southdown Quarry Project

Conducted by NJDEP
Division of Science Research and Technology
in Conjunction with the
Environmental and Occupational Health Sciences Institute

Asbestos Site Evaluation, Communicaiton and Cleanup

Keystone, Colorado
September 22—26, 2003



SITE BACKGROUND
Overview

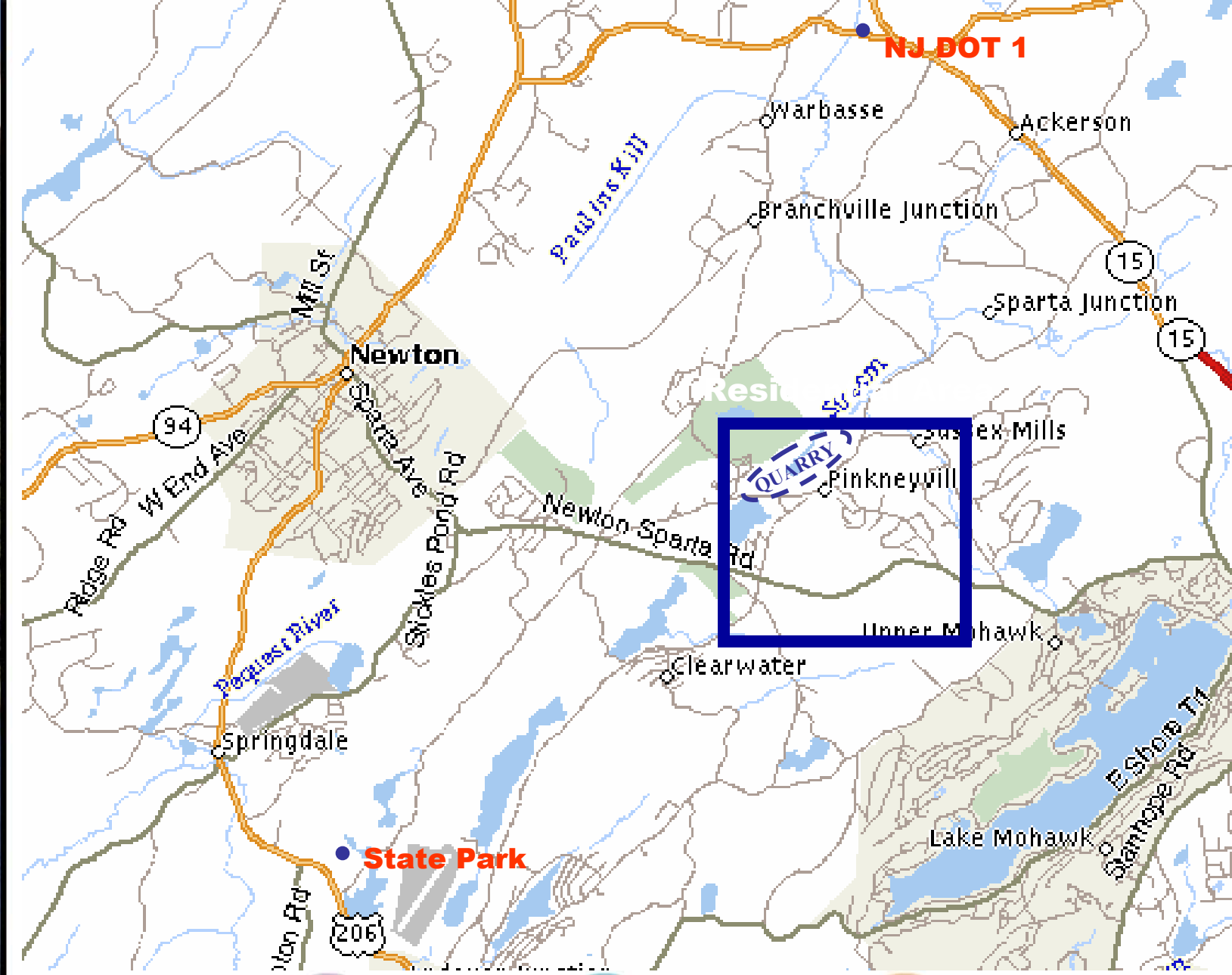
- Southdown* Quarry in Sparta, NJ was opened in the early 1900s as a source of limestone and related products and has been in continuous operation since that time.



SITE BACKGROUND
Geography/Affected Area

- Sparta New Jersey




NJ DOT 1
Warbasse
Ackerson
Branchville Junction
Paulins Kill
15
Sparta Junction
15
Newton
Main St
94
Spring Ave
Ridge Rd
W End Ave
Sickles Pond Rd
Newton Sparta Rd
QUARRY
Pinkneyville
Clearwater
Upper Mohawk
Peqaest River
Springdale
State Park
206
Lake Mohawk
E Shore Rd
Stanhope

New Jersey Department of Environmental Protection
Air Compliance and Enforcement, Northern Bureau

0.4 0 0.4 0.8 Miles

Munbound

unpaved road emissions

blasting and excavation

Southdown Quarry
Sparta, Sussex County

processing stacks

loading, dumping, and storage piles

N
W E
S

Background

- EOHSI was contracted to investigate, in cooperation with NJ DEP and USEPA Region 2, the exposure and risk associated with potential asbestos emissions from Southdown Quarry.
- A Southdown Expert Group was formed to advise and consult on the project
  - NJDHSS, EOHSI, NYU Inst. Env. Med., USEPA, NJDEP, Aeolus Inc. (consultant to EPA)



SITE BACKGROUND
Population Affected

- The area near the Quarry has had a significant increase in population and housing construction in the past decade.
- Currently, the nearest residence is ½ mile from the quarry.
- In 1999, concern arose that fugitive emissions from the quarry might expose the surrounding population to asbestos fibers.



SITE BACKGROUND
Mineral Forms of Asbestos

- Indications for risk potential:
  - Observed presence of tremolite mineral mined at the quarry.
    - Tremolite can occur in asbestos and non-asbestos forms
  - Reported detection of tremolite asbestos structures on an air conditioning filter at a residence.
  - The known carcinogenicity of tremolite asbestos



SITE BACKGROUND
Asbestos-Related Health Effects

- Occupational Exposure

- Environmental Exposure



Asbestos Analysis and Risk Assessment

- "Asbestos" is not a specific chemical or mineral.
  - A commercial designation for useful size range of a group of fibrous minerals.
- It is generally agreed that health risk from asbestos is related to size and shape.
  - The identification of the characteristics most predictive of risk are not yet settled in the scientific community.



Asbestos Analysis and Risk Assessment *(cont'd)*

- Current USEPA and NIOSH asbestos risk metrics are based on light microscope (PCM) analysis of exposure in populations with asbestos-related disease.
- However, many asbestos fibers can only be seen using the electron microscope (TEM).
  - Current information suggests that many TEM visible fibers are more potent carcinogens than those visible under PCM.

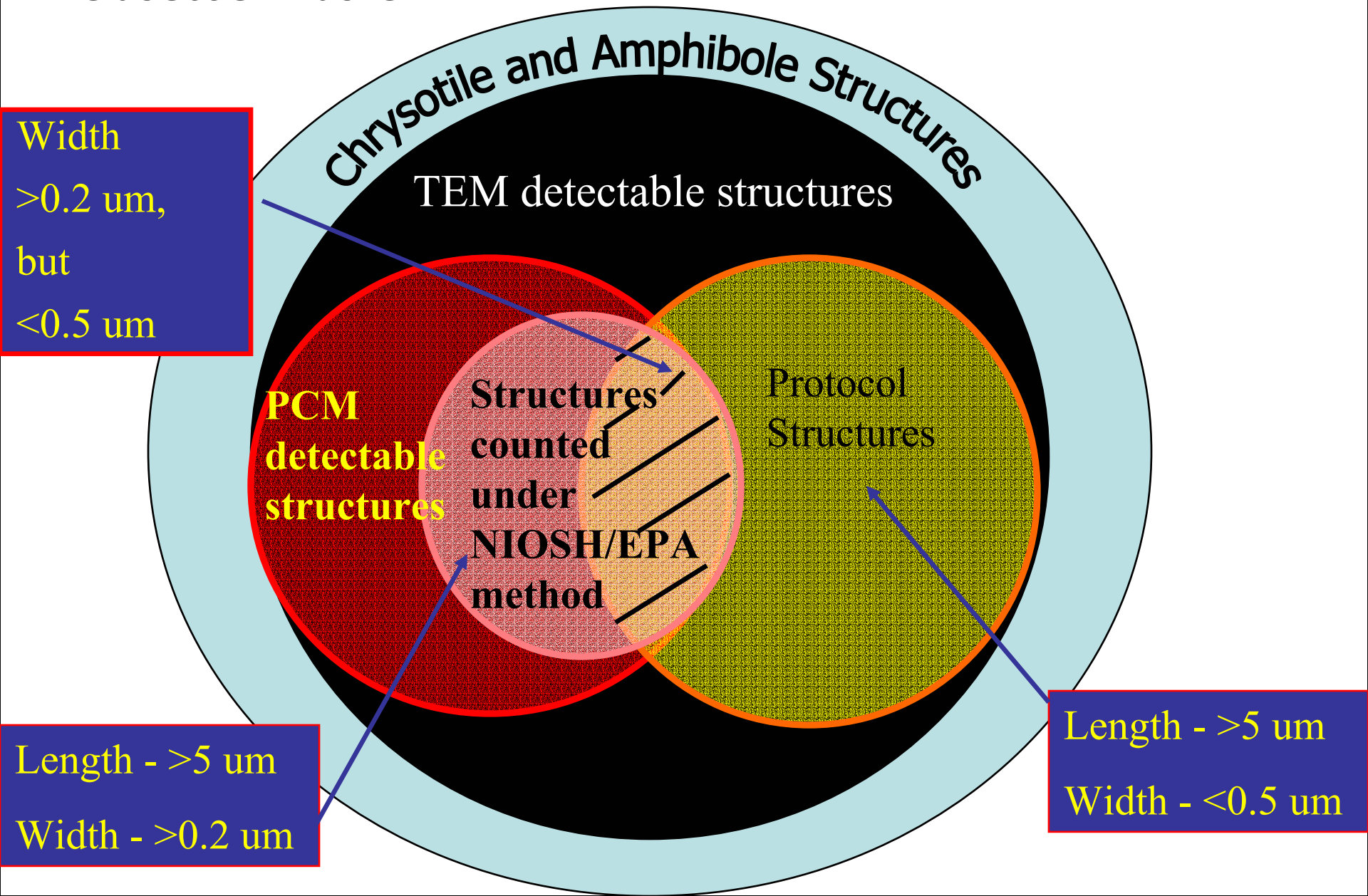


Project Technical Design

- Measurement of asbestos structures in indoor and outdoor air at residences near the quarry.
- Measurements of asbestos structures in indoor residential dust and in outdoor soil.
- Modeling of potential future exposure based on analysis of quarry cores, source-specific emission factors, and air dispersion.



Relationship Between Protocol Structures and EPA/NIOSH Asbestos Fibers



Asbestos Analysis and Risk Assessment *(cont'd)*

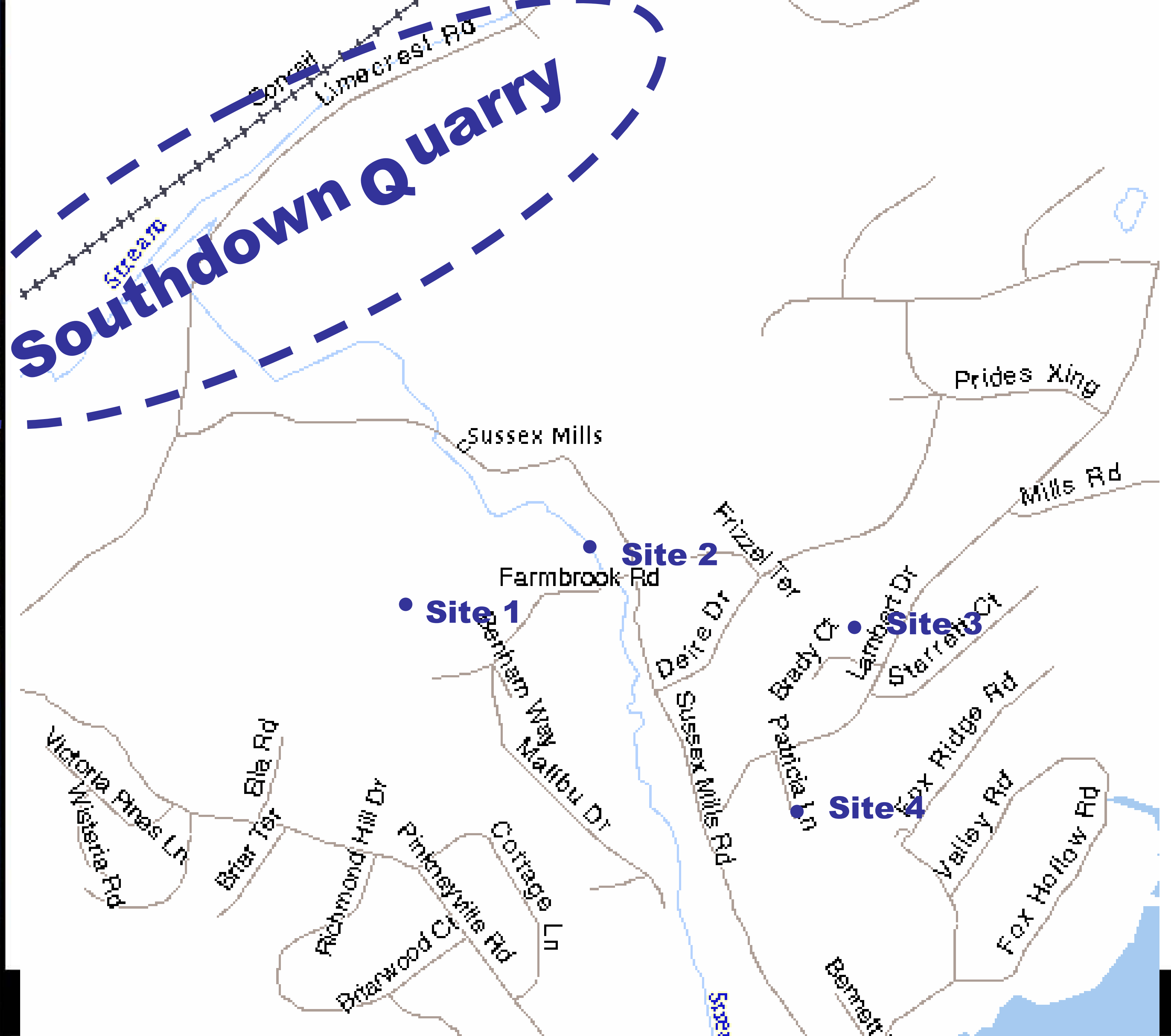
- This results in two different methods for counting asbestos fibers and assessing the associated risk
  - NIOSH method 7402 (EPA-IRIS)
  - Protocol structure
    - Endorsed by Southdown Expert Group
    - Currently scheduled for EPA peer-review
- Results are reported using both metrics



ACTIVITIES BY EXPOSURE PATHWAY – Sampling Strategy (Air)

- To provide estimates of outdoor and indoor air asbestos concentrations.
  - Air samples collected at 4 residences close to and downwind of the quarry.
    - indoors and outdoors
  - 2 remote (control) sites (outdoors only).
  - Two rounds of 7-consecutive day samples at each site.
    - 24-hour duration for each sample




Southdown Quarry
Limecrest Rd
Stream
Sussex Mills
Prides Xing
Mills Rd
Frizzel Ter
Site 2
Farmbrook Rd
Site 1
Site 3
Site 4
Deire Dr
Brady Ct
Lamport Dr
Sussex Mills Rd
Patricia Ln
Fox Ridge Rd
Valley Rd
Fox Hollow Rd
Malibu Dr
Victoria Pines Ln
Wisteria Rd
Ela Rd
Briar Ter
Richmond Hill Dr
Pinkneyville Rd
Briarwood Ct
Cottage Ln

ACTIVITIES BY EXPOSURE PATHWAY – Sampling Strategy (Dust)

- To examine historical deposition in homes
- To investigate whether the quarry is the source of residential asbestos deposition
  - Dust was collected in houses with different distances to the Quarry: Near, Middle, Far.
  - Dust was collected from undisturbed locations (e.g. window troughs).
    - Soil was collected outside some of the houses.



Modeling of Potential Future Exposure and Risk

- Estimation of future ambient air exposure to asbestos based on
  - Modeling of
    - Quarry dust emissions factors
    - Air dispersion
  - Combined with measured asbestos content of core dust
    - Averaged over approx two lifetimes



Results - Air

- 192 air samples collected
  - (including 24 blanks)
- 3 samples were positive for protocol structures and 3 samples for NIOSH 7402 structures.
- All positive samples were taken outdoors
  - No positive indoor samples
  - Indicates outdoor source of asbestos



Positive Air Sample Results

Start Date	Location	Distance (mi)	Concentration (s/cc)	Type	Protocol or 7402	Wind Direction	Comment
4/21/01	Site 3	1.07	0.00029	Amphibole	Protocol	S-SE	upwind
5/04/01	Site 1	0.52	0.00015	Amphibole	Protocol	N-NW	downwind
5/04/01	NJ DOT	2.38	0.00031	Chrysotile	Protocol	N-NW	downwind
5/10/01	NJ DOT	2.38	0.00037	Amphibole	7402	Variable E to NW	
5/15/01	Site 1	0.52	0.00039	Amphibole	7402	NW	downwind
6/11/01	Site 2	0.66	0.00036	Amphibole	7402	Variable (light)	



Observations - Air

- Residential sites 1, 2, and 3 found detectable levels of Amphibole
  - 1-2 fibers/structures detected in each sample
- Background site 1 (NJ DOT) found detectable levels of Amphibole and Chrysotile
  - Chrysotile not found in quarry
  - Possibly from brake linings



Quarry Activity On Days With Positive Air Samples

Air Sampling Period	Avg. % Daily Capicity, Combined Process Categories *
4/21/01 - 4/22/01	5.5%
5/04/01 -5/05/01	12.4%
5/10/01 -5/11/01	40.4%
5/15/01 - 5/16/01	34.2%
6/11/01 -6/12/01	31.9%

* Includes primary crushing, recrushing, dryer, mill, and pellet plant



Results - Dust

- 54 house dust samples and three blanks were collected from 28 homes
- All samples were taken from window wells or other undisturbed areas, representing accumulation over an indefinite time period
- Only two samples were positive for asbestos

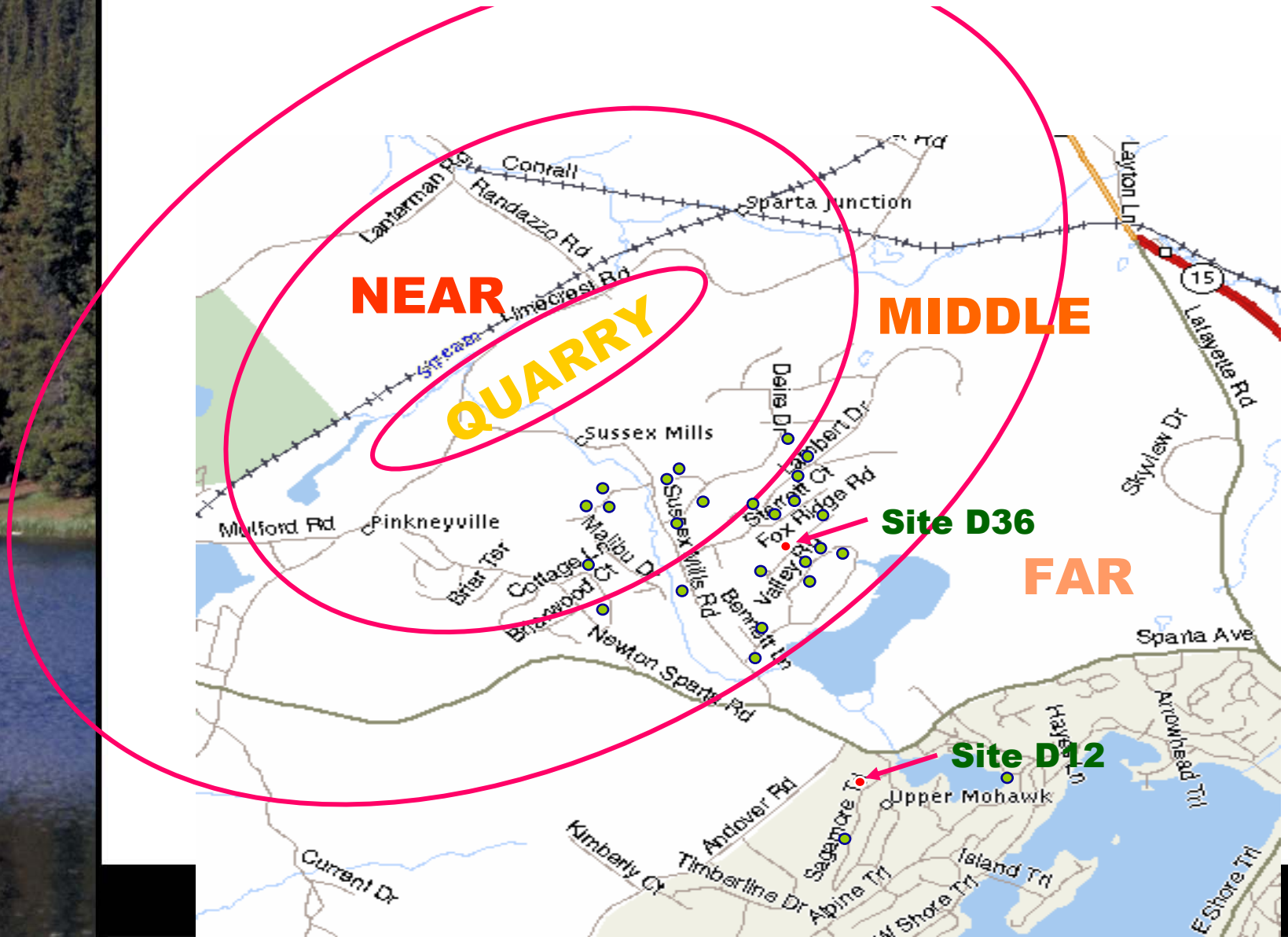


Observations -Dust

- In each house with positive results a total of 2 structures/fibers was detected.
- The houses with positive dust samples are among the oldest houses sampled, and would be expected to accumulate more asbestos from all sources (potentially including, but not limited to the quarry) than younger houses.



Dust Sample Locations



Dust Sampling Zones

Zone	Number of Houses	Distance from Quarry	Average Age of Houses
Near	10	0.5 - 1.0 Miles	11 years
Middle	15	1.0 - 1.25 Miles	28 years
Far	3	> 1.5 Miles	49 years



Summary of Air and Dust Findings

- At the two closest sites, Site 1 and Site 2, asbestos fibers were found in ambient air samples on three dates.
- On all three dates the wind was from a direction which could have carried structures from the quarry.
- On all three dates the quarry was in production and operating normally.



Summary

- Indoor air samples and indoor dust samples near the quarry were negative for both Protocol structures or NIOSH 7402 fibers.
- Only two sites, in the Mid field and the Far-field, identified asbestos in house dust
  - There may be other sources of asbestos at these locations, such as soil

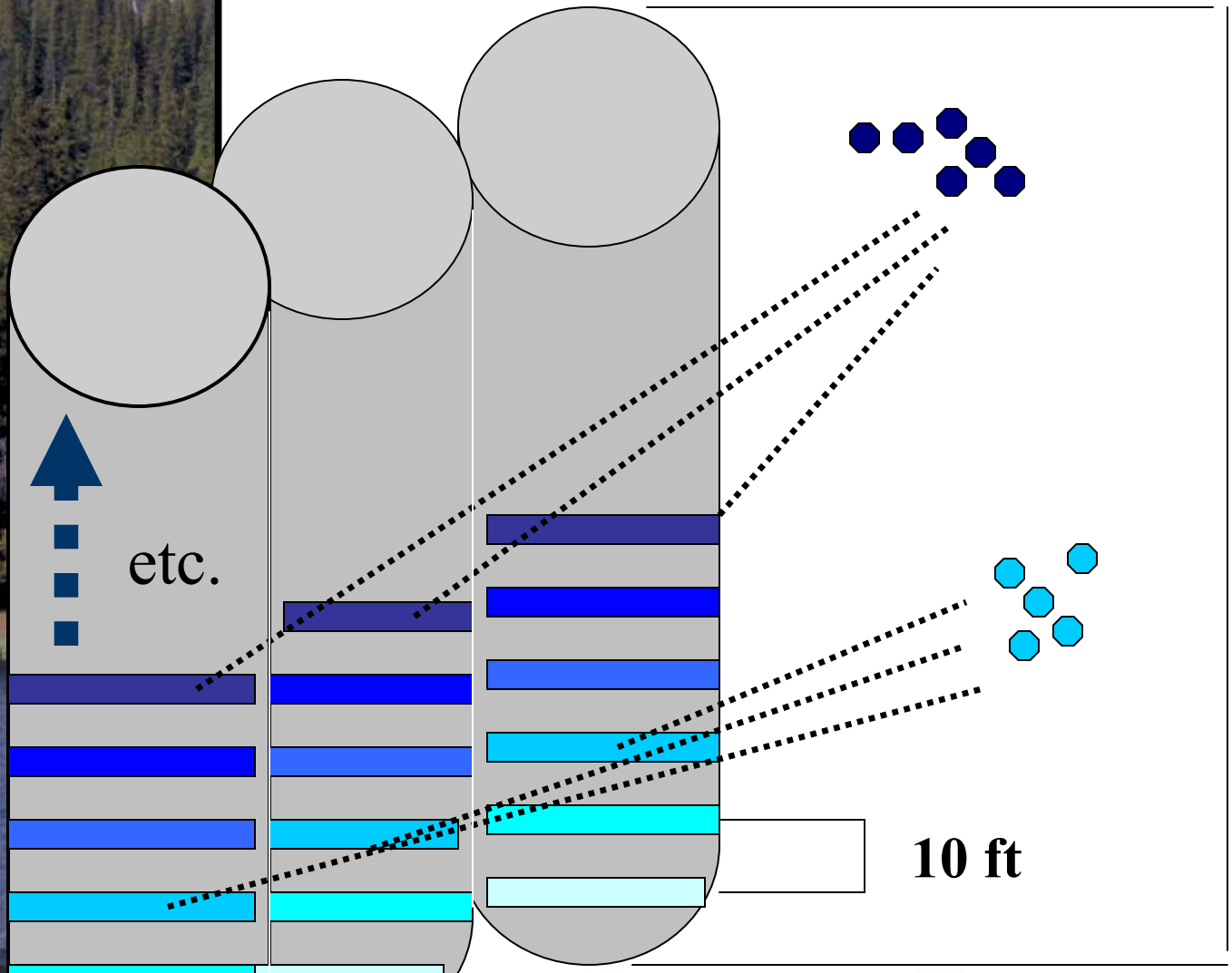


Design of Phase 2 Study

Rock Core Sampling and Emissions/Dispersion Modeling of Asbestos Exposure and Risk

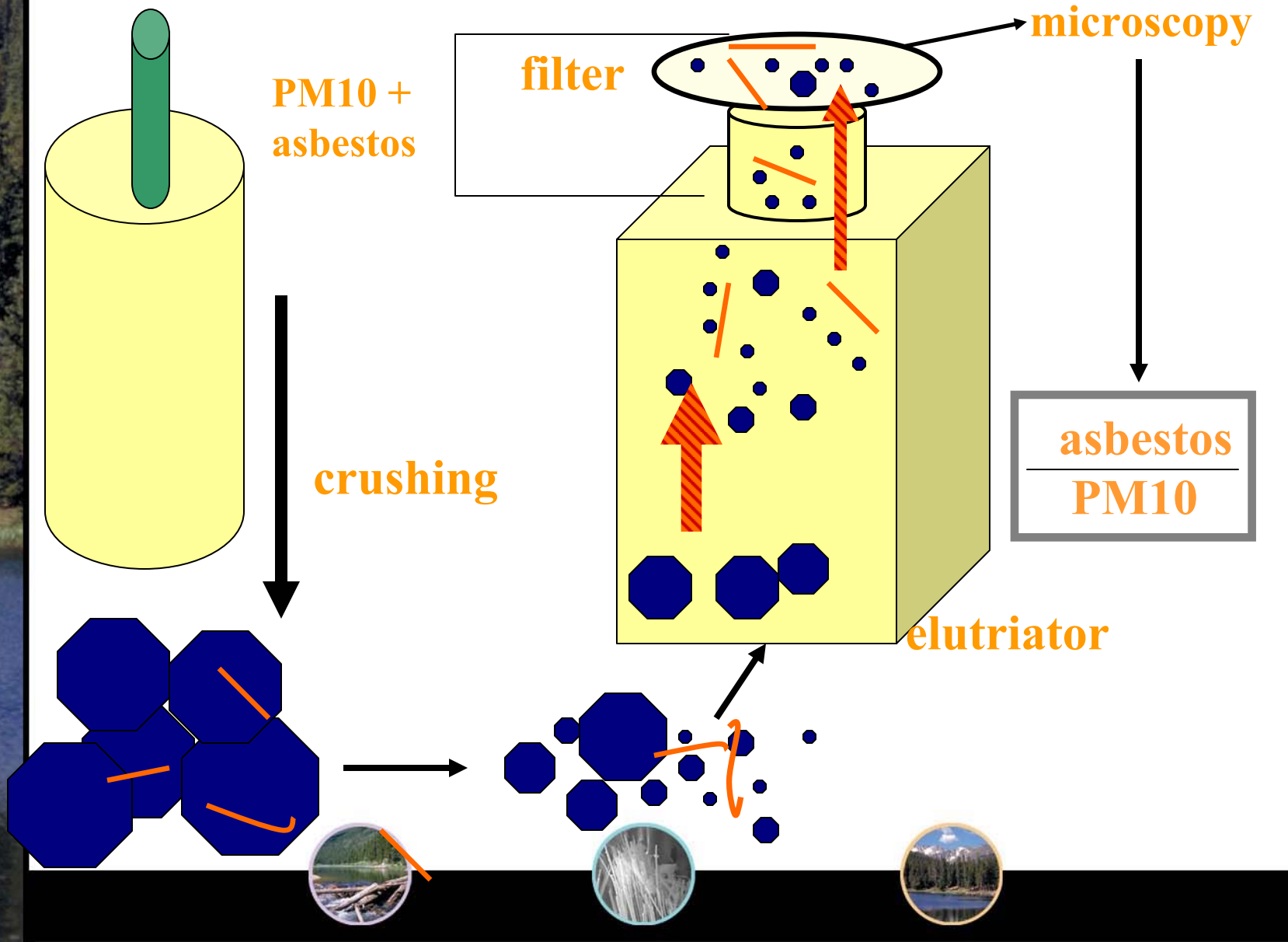


Rock Core Sampling Scheme

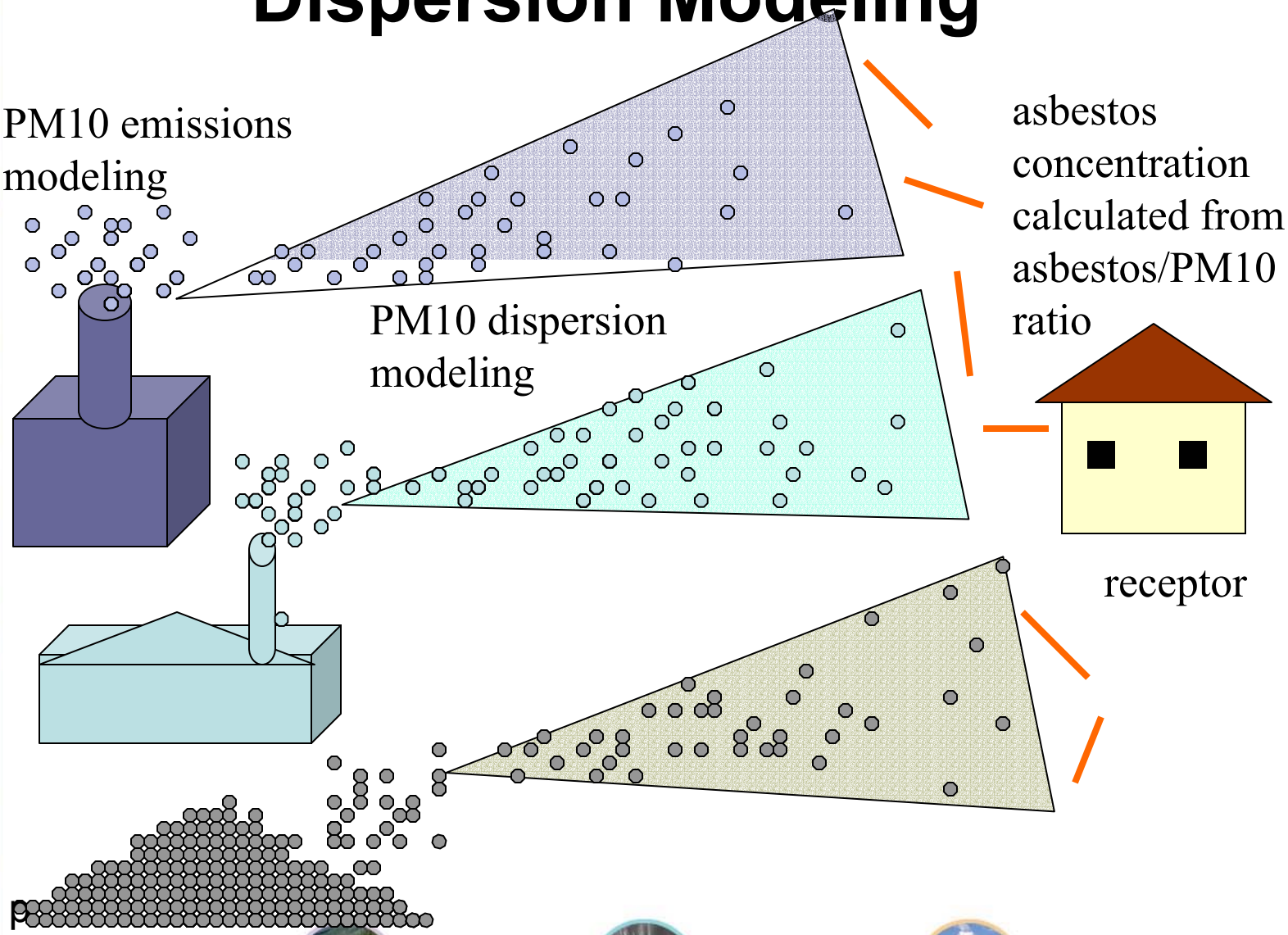


150 ft
(~150 yrs of
production)

Determination of Asbestos/PM10 Ratio Using Superfund Method



PM10/Asbestos Emission and Dispersion Modeling



QUESTIONS?

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